

The Office Action

The Examiner rejected claims 1-25 under 35 U.S.C. § 102(b) as being anticipated by MacMillan et al WO97/45507 ("Macmillan"). Applicant respectfully request that the Examiner reconsider the rejection in view of the below remarks.

REMARKS

This response is submitted in reply to the outstanding office action of October 30th, 2006. Reconsideration of the application in view of this response is respectfully requested.

A. The §102 Rejection Based on MacMillan

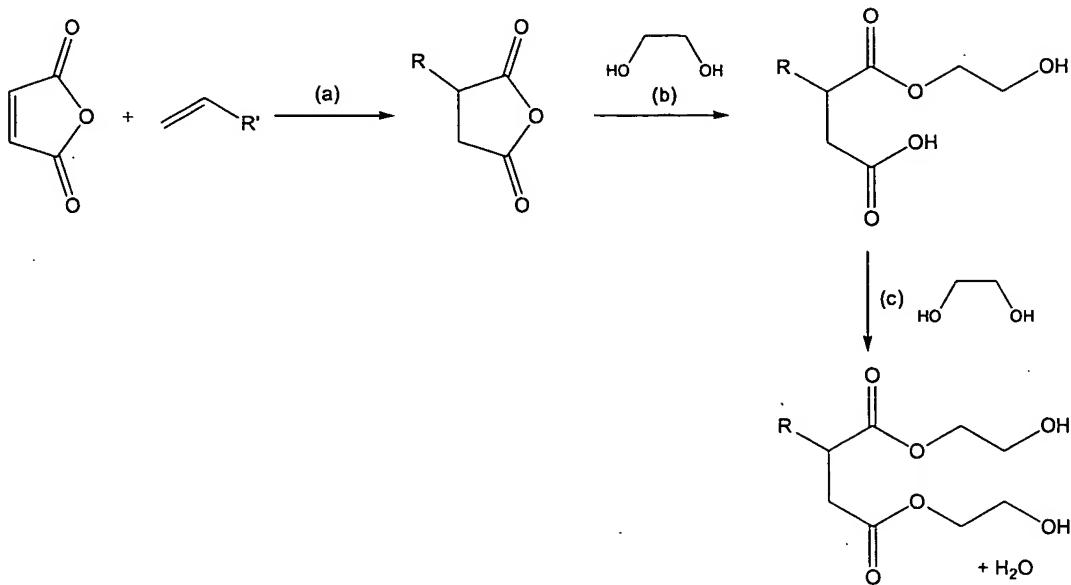
The present invention is directed toward using a defined dicarboxylic acid, or its acid anhydride, or its mono-ester, as a corrosion inhibitor in a fuel. Macmillan, on the other hand, discloses diester compounds as fuel additives. The mono-esters, diacids and acid anhydrides used in the present invention are not disclosed as fuel additives in MacMillan. However, the acid anhydride is disclosed in Macmillan as a starting material for the preparation of the diesters (column 3, lines 12-25 of Macmillan).

In the final office action, the Examiner acknowledges the Applicants' statement that the compound in Macmillan in which R₂ and R₃ are represented by "-O-" is used as a reactant to form the reference compound formula (I) which is added to the fuel, and that the reference compound in which R₂ and R₃ are represented by "-O-" is further reacted with an alcohol of R₂OH and/or R₃OH to produce the reference compound of formula (I) that is added the fuel. However, the Examiner counters this argument by stating that "after reaction with the anhydride or alcohol(s), '-O-' structure can still be maintained and used for corrosion inhibition." As discussed in more detail below, however, this is simply not the case due to the reaction conditions described in Macmillan. That is, the Examiner's position appears to be this: one would expect some carry-over of the acid anhydride reactant into the final product of Macmillan. Some acid anhydride would therefore be present in the fuel, as a fuel additive, and would anticipate the claim.

Given the chemistry which MacMillan describes, however, this would not happen. That is, the reaction conditions disclosed in Macmillan are clearly designed to produce a diester. There is no realistic expectation of retaining unreacted acid anhydride (or,

indeed, intermediate mono-ester products).

Consider first, the reaction conditions described in column 3 of Macmillan. The reaction being carried out is shown below:



In Macmillan at column 3, 4 examples A to D are described. Examples A and B describe step (a) above, the formation of a compound of formula (I) by reaction of maleic anhydride and an olefin. Examples C and D start from compound (I). In all of the examples, a compound of formula (I) is reacted with an excess of ethylene glycol. This reaction occurs in two stages, via steps (b) and (c).

Step (b), above is the formation of the monoester from the anhydride by reaction of a first equivalent of ethylene glycol. This reaction is highly favorable, because the leaving group in the esterification reaction is the highly stabilized carboxylic acid moiety, and the formation of the ester relieves strain in the anhydride ring structure.

Step (c), above, is the formation of the diester by reaction of the carboxylic acid and a second equivalent of glycol. Like all such esterification reactions, water is produced and the reaction is reversible. However, it is possible to drive the reaction to completion by pushing the equilibrium in favor of the diester product. This can be done by using a high excess of alcohol or by removal of water so the reverse reaction cannot occur.

In Example A of Macmillan, the molar ratio of glycol to anhydride is 2.2:1. An excess of alcohol is used i.e., more than enough equivalents to form the diester

product. Further, Macmillan discloses that the reaction is heated for eight hours and water is continuously removed. The skilled chemist reading this experimental protocol would see that the reaction is being driven to completion and would appreciate that the resultant product would be the diester.

In Example B of Macmillan, 6 molar equivalents of ethylene glycol are used per mole of anhydride. The reaction is solvent free and heated at 170°C for twelve hours. Under these conditions and with such a high excess of glycol there is no expectation that anything other than diester would be formed.

In Example C, 2.2 molar equivalents of glycol are added to anhydride and the mixture is heated with Dean Stark removal of water "until the reaction was completed". Thus, again, the reaction conditions make it clear to one skilled in the art that the diester product is formed.

It is not possible from Example D to calculate the exact ratio of reactants, because insufficient information is given. However it seems clear from a comparison with the amounts used in Example B that an excess of glycol is again used. Once more, continuous removal of water is carried out. Therefore, the favored/expected product is again the diester.

Macmillan's expressed intention is to use a diester product as an additive for fuel. The reaction conditions he discloses are entirely consistent with this, driving the above reactions to completion. For the reasons stated the diester products will be formed, under these conditions without any unreacted anhydride or mono-ester. Thus, it is therefore submitted that Macmillan very clearly discloses, in his express wording and in his implicit content, the conversion of ALL anhydride starting material to the diester product, before addition to a fuel.

Further, the Examiner has provided no support for his argument that anhydride would be left after the above reactions. To support such an argument, the conclusion must be a NECESSARY result, not merely a possible result. *In re Oelrich*, 212 USPQ 323 (CCPA 1981); *Ex parte Keith*, 154 USPQ 320 (POBA 1961). See also, *In re Robertson*, 49 USPQ2d 1949, 1951 (Fed. Cir. 1999). In relying on such a theory, the Examiner must provide a basis in fact or technical reasoning to support the determination that the allegedly characteristics NECESSARILY flow from the teachings of the prior art. *Ex parte Levy*, 17 USPQ2d 1461 (BPAI 1990). Here, the Examiner has provided no technical reasoning why one would expect any of the reactant anhydride to

survive. In light of the above, withdrawal of this rejection is requested.

CONCLUSION

For the reasons detailed above, it is respectfully submitted all claims remaining in the application (Claims 1-25) are now in condition for allowance.

Respectfully submitted,

FAY SHARPE LLP

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Date

Joseph Waters
Joseph E. Waters, Reg. No. 50,427
1100 Superior Avenue, Seventh Floor
Cleveland, OH 44114-2579
216-861-5582

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